CLEAN COPY OF NEW AND AMENDED CLAIMS

1. (Amended) A method of fabricating a semiconductor device having a ferroelectric capacitor, comprising the steps of:

forming an active device element on a substrate;

forming an insulation film over said substrate to cover said active device element;

forming a lower electrode layer of said ferroelectric capacitor over said insulation film;

forming a ferroelectric film on said lower electrode layer as a capacitor insulation film of said ferroelectric capacitor;

crystallizing said ferroelectric film by applying a thermal annealing process in an atmosphere containing a non-oxidizing gas and an oxidizing gas; and

forming an upper electrode layer on said ferroelectric film,

wherein said step of crystallizing said ferroelectric film is conducted by setting a composition of said atmosphere such that said atmosphere contains said oxidizing gas with a fraction of 1 to 20% in volume.

7. (Amended) A method as claimed in claim 1, wherein said step of forming said ferroelectric film comprises the step of forming said ferroelectric film by a sputtering process.

15. (Amended) A semiconductor device, comprising:

a substrate;

an active device element formed on said substrate;

an insulation film provided over said substrate to cover said active device element;

a lower electrode containing Pt provided over said insulation film;

a ferroelectric film provided on said lower electrode, said ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said ferroelectric film essentially consisting of crystal grains having a generally uniform grain diameter of less than about 200 nm; and

an upper electrode provided on said ferroelectric film.

21. A method of fabricating a semiconductor device having a ferroelectric capacitor, comprising the steps of:

forming an active device element on a substrate;

forming an insulation film over said substrate to cover said active device element;

forming a lower electrode layer of said ferroelectric capacitor over said insulation film;

forming a ferroelectric film on said lower electrode layer as a capacitor insulation film of said ferroelectric capacitor;

crystallizing said ferroelectric film by applying a thermal annealing process in an atmosphere containing a non-oxidizing gas and an oxidizing gas; and

forming an upper electrode layer on said ferroelectric film,

wherein said step of crystallizing said ferroelectric film is conducted by setting the composition of said atmosphere such that said atmosphere contains said oxidizing gas with a fraction of 1 – 20% by volume, and wherein said method further comprises the step, after said step of crystallizing said ferroelectric film, of oxidizing said ferroelectric film in an oxidizing atmosphere.

22. A method as claimed in claim 21, wherein said step of forming said lower electrode layer includes depositing a Ti layer and a Pt layer consecutively.

23. A method as claimed in claim 21, wherein said non-oxidizing gas is selected from a group consisting of Ar, He, Ne, Xe and N_2.

24. A method as claimed in claim 21, wherein said oxidizing gas is selected from a group consisting of O_2, N_2O, NO and NO_2.

25. A method as claimed in claim 21, wherein said step of crystallizing said ferroelectric film is conducted by a rapid thermal annealing process.

26. A method as claimed in claim 21, wherein said step of forming said ferroelectric film comprises the step of forming said ferroelectric film by a sputtering process.

27. A method as claimed in claim 26, wherein said ferroelectric film has a perovskite structure.

28. A method as claimed in claim claim 27, wherein said ferroelectric film is a film of zirconate titanate of Pb.